

**AMENDMENTS TO THE CLAIMS**

1-29. (Canceled)

30. (Currently amended) A substantially pure protein preparation ~~as in claim 29 wherein said comprising a polypeptide that~~ comprises an amino acid sequence selected from the group consisting of:

- (a) SEQ ID NO: 2;
- (b) SEQ ID NO: 4;
- (c) SEQ ID NO: 6;
- (d) residues 104-126, ~~146-166, 176-195, 206-228, 241-262, and 316-340~~ of SEQ ID NO: 2;
- (e) residues 104-126, ~~146-166, 176-195, 206-228, 241-262, and 316-340~~ of SEQ ID NO: 4;
- (f) residues 102-124, 144-164, 174-193, 204-227, 239-260, and 314-338 of SEQ ID NO: 6;
- ~~(g) residues 127-145, 196-205, and 263-315 of SEQ ID NO: 2;~~
- ~~(h) residues 127-145, 196-205, and 265-315 of SEQ ID NO: 4;~~
- (i) ~~(g)~~ residues 125-143, 194-203, and 261-313 of SEQ ID NO: 6;
- ~~(j) residues 280-303 of SEQ ID NO: 2;~~
- ~~(k) residues 280-303 of SEQ ID NO: 4;~~
- (l) ~~(h)~~ residues 278-301 of SEQ ID NO: 6;
- ~~(m)~~ (i) residues ~~266-275~~, 386-400, 447-458, and 482-494 of SEQ ID NO: 2;
- ~~(n)~~ (j) residues 66-99, 266-275, and 394-414 of SEQ ID NO: 4; and
- ~~(o)~~ (k) residues 64-89, 262-275 and 562-588 of SEQ ID NO: 6.

31. (Currently amended) A substantially pure protein preparation comprising a polypeptide comprising an amino acid sequence having at least 80% amino acid sequence identity with the amino acid sequence of a polypeptide selected from the group consisting of:

- (a) a CatSper2 protein, wherein the CatSper2 protein comprises the amino acid sequence of SEQ ID NO:2, SEQ ID NO:4, or SEQ ID NO:6;

(b) at least a transmembrane domain of a CatSper2 protein wherein the CatSper 2 protein comprises the amino acid sequence of SEQ ID NO:2, SEQ ID NO:4, or SEQ ID NO:6;

(c) at least an extracellular loop of a CatSper2 protein wherein the CatSper2 protein comprises an amino acid sequence of SEQ ID NO:2, SEQ ID NO:4, or SEQ ID NO:6; and

(d) at least a pore region of a CatSper2 protein, wherein the CatSper2 protein comprises an amino acid sequence of SEQ ID NO:2, SEQ ID NO:4, or SEQ ID NO:6;  
wherein the amino acid sequence having at least 80% amino acid sequence identity to a polypeptide of (a), (b), (c), or (d) is not identical to an amino acid sequence of the amino acid sequence of (a), (b), (c), or (d).

32. (Currently amended) A substantially pure protein preparation of claim 31, wherein the comprising a polypeptide comprising an amino acid sequence having at least 80% amino acid sequence identity with an amino acid sequence of a CatSper2 protein(a), (b), (c), or (d) of claim 31, has and having at least one CatSper2 feature or activity in a cell capable of expressing CatSper2 activity.

33-111. (Canceled)

112. (New) A substantially pure protein preparation comprising a polypeptide consisting of an amino acid sequence selected from the group consisting of:

- (a) SEQ ID NO: 2;
- (b) SEQ ID NO: 4;
- (c) SEQ ID NO: 6;
- (d) residues 104-126, 146-166, 176-195, 206-228, 241-262, and 316-340 of SEQ ID NO: 2;
- (e) residues 104-126, 146-166, 176-195, 206-228, 241-262, and 316-340 of SEQ ID NO: 4;
- (f) residues 102-124, 144-164, 174-193, 204-227, 239-260, and 314-338 of SEQ ID NO: 6;
- (g) residues 127-145, 196-205, and 263-315 of SEQ ID NO: 2;
- (h) residues 127-145, 196-205, and 265-315 of SEQ ID NO 4;

- (i) residues 125-143, 194-203, and 261-313 of SEQ ID NO 6;
- (j) residues 280-303 of SEQ ID NO: 2;
- (k) residues 280-303 of SEQ ID NO: 4;
- (l) residues 278-301 of SEQ ID NO: 6;
- (m) residues 266-275, 386-400, 447-458, and 482-494 of SEQ ID NO: 2;
- (n) residues 66-99, 266-275, and 394-414 of SEQ ID NO: 4; and
- (o) residues 64-89, 262-275 and 562-588 of SEQ ID NO: 6.

113. (New) The protein preparation of claim 31, wherein the polypeptide has at least 85%, 90%, or 95% identity to the amino acid sequence of (a), (b), (c), or (d).

114. (New) The protein preparation of claim 32, wherein the polypeptide has at least 85%, 90%, or 95% identity to the amino acid sequence of (a), (b), (c), or (d) of claim 31.

115. (New) The polypeptide of claim 32, wherein the polypeptide can complement the activity of an inactive mutant CatSper2 polypeptide.

116. (New) A substantially pure protein preparation comprising a polypeptide comprising an amino acid sequence selected from the group consisting of:

- (a) at least a transmembrane domain of a CatSper2 protein wherein the CatSper 2 protein comprises the amino acid sequence of SEQ ID NO:2, SEQ ID NO:4, or SEQ ID NO:6;
- (b) at least an extracellular loop of a CatSper2 protein wherein the CatSper2 protein comprises an amino acid sequence of SEQ ID NO:2, SEQ ID NO:4, or SEQ ID NO:6; and
- (c) at least a pore region of a CatSper2 protein, wherein the CatSper2 protein comprises an amino acid sequence of SEQ ID NO:2, SEQ ID NO:4, or SEQ ID NO:6.

117. (New) The substantially pure protein preparation of claim 116, wherein the polypeptide has at least one CatSper2 feature or activity in a cell capable of expressing CatSper2 activity.

118. (New) A substantially pure protein preparation comprising a polypeptide consisting of an amino acid sequence selected from the group consisting of:

- (a) a transmembrane domain of a CatSper2 protein wherein the CatSper 2 protein comprises the amino acid sequence of SEQ ID NO:2, SEQ ID NO:4, or SEQ ID NO:6;
- (b) an extracellular loop of a CatSper2 protein wherein the CatSper2 protein comprises an amino acid sequence of SEQ ID NO:2, SEQ ID NO:4, or SEQ ID NO:6; and
- (c) a pore region of a CatSper2 protein, wherein the CatSper2 protein comprises an amino acid sequence of SEQ ID NO:2, SEQ ID NO:4, or SEQ ID NO:6.